

CLAIMS

1. An apparatus for measuring the internal and external profile of metal pipes at the ends thereof, comprising at least a pair of sensors (11a, 11b) suitable for measuring the distance from the external and from the internal profile respectively of the pipe (1), kept in a fixed position, characterized in that said sensors are mounted on a support (10) orthogonal to the theoretical axis (X-X) of the pipe (1) and rotatable around its axis of rotation, there being provided means for carrying vertically said axis of rotation next to said axis (X-X) and means suitable for recording the measure data taken for each polar coordinate relevant to the instantaneous angular position of said sensors (11a, 11b) during the rotation of said support (10) driven by motor means (21), in correspondence of means (20) suitable for detecting said angular position.

2. An apparatus according to claim 1, characterized in that said sensors (11a, 11b) are radially movable on said support (10) in order to regulate their distance from the center of the support itself and therefore from said axis (X-X) of the pipe (1) as a function of the size of diameter and thickness of the pipe itself.

3. An apparatus according to claim 1 or 2, characterized in that said support (10) of the sensors (11a, 11b) is mounted at the end of an internally hollow spindle or sleeve (12) which is driven at the opposite end by means (21, 22, 22a) in order to be drawn into rotation with respect to a slide member (13) vertically movable for changing the height of the axis of rotation thereof and slidable in a direction parallel to said axis.

4. An apparatus according to claim 3, characterized in that said slide (13) is supported on a platform (14) with respect to which it is slidable in a direction parallel to the axis of rotation thereof, along guides (13a) integral with said platform (14).

5. An apparatus according to claim 4, characterized in that said platform (14) supporting the slide (13) is vertically movable being mounted at the top of four mechanical jacks (15, 15a, 15b, 15c) at the four corners of the substantially rectangular shape thereof, said jacks being driven by a single motor (24) by means

of angular drive transmission gears (25).

6. An apparatus according to claim 4 or 5, characterized in that two guiding columns (26, 26a) are provided at two opposite corners at the ends of an ideal diagonal, at the center of which said platform is mounted at the top of the 5 piston (16a) of a pneumatic cylinder (16) suitable for ensuring the maintainance of the achieved vertical position.

7. An apparatus according to claim 3, characterized in that said slide (13) is driven, for its horizontal sliding, by means of an electromechanical jack (17) mounted with the driving member thereof (27) on said platform (14) and integral 10 with the slide (13) by means of brackets (18).

8. An apparatus according to claim 2, characterized in that said sensors (11a, 11b) are slidably mounted along slides (31a, 31b) integral with said board (10), having a round shape, substantially parallel to a diameter thereof, and are driven by means of respectively independent motors (28a, 28b) so as to slide in 15 correspondence of the diameter to which said slides are parallel between a position coincident with axis (X-X) for the internal sensors (11b) and a peripheric position for the external sensors (11a) at a distance from said axis which is higher than the radius of the external profile for the pipe having the maximum diameter which is to be measured.

20 9. An apparatus according to one or more of the previous claims, characterized in that said jacks for the vertical movement (15, 15a, 15b, 15c) and horizontal movement (17) of the rotation axis of said support (10) as well as the distance regulation members (28a, 28b) of the two sensors (11a, 11b) along a diameter of the support are ball screw jacks with backlash compensation.

25 10. An apparatus according to claim 1, characterized in that inside the hollow spindle or sleeve (12) are passing the cables and the conduits for supplying said sensors (11a, 11b) and said respective regulation motors, as well as for transmitting the detected measures to a data processing system, in combination with the relevant polar coordinates taken from said impulse generator (20).

30 11. A method for automatically measuring the external and internal profile of metal pipes at the ends thereof, characterized in that it comprises

detecting the distance data of sensors (11a, 11b) respectively from an external generatrix and the corresponding internal generatrix at the end of the pipe (1) to be measured, kept in a fixed position, said sensors being rotatable around an axis parallel and next to the axis (X-X) of the pipe, the distance data detected in 5 correspondence of each polar coordinate acquired by means of an impulse generator or encoder (20) being sent to the inlet of a data processor for generating a classification code of the profile, based on the processing of the detected data.

12. A method according to claim 11, characterized in that the processed measure data are fed to the inlet of a feedback control system of the pipe 10 production.

13. A method according to claim 11, characterized in that it is provided with optimization algorithms of the couplings between ends of pipes, with respect to the relevant angular positions.